REMARKS

This amendment is responsive to the Final Office Action dated May 5, 2006. Applicant has amended claims 1, 37, 44, 46-48, 52, and 55, and cancelled claim 29-36, 45 and 49. Claims 1-28, 37-39, 41-44, 46-48 and 50-69 are pending.

Allowable Subject Matter

In the Final Office Action, the Examiner objected to claim 49 as including subject matter that would be allowable if rewritten in independent form. In this amendment, Applicant has amended independent claim 44 to include all subject matter recited by allowable claim 49 and any intervening claim. Consequently, independent claim 44 and the claims dependent therefrom are in condition for allowance.

Claim Objections

The Examiner Objected to claims 1, 29, 31, 37, 44 and 55 for certain informalities. Applicant has amended the claims accordingly.

Claim Rejection Under 35 U.S.C. § 103

Claims 1-28, 37-39, 41-44, 46-48 and 50-69

In the Final Office Action, the Examiner rejected claims 1-18, 26-28, 44-48, 50-54 and 55-69 under 35 U.S.C. 103(a) as being unpatentable over Lemchen (US 5,011,405) when modified in view of Taub (US 6,739,869) and Sachdeva (US 6,736,638). Similarly, the Examiner rejected claims 19-25 as being unpatentable over Lemchen in view of Taub and Sachdeva in view of Mortenson (Mortenson, Michael E.; "Geometric Modeling", 1985, John Wiley & Sons). The Examiner rejected claims 37-39 and 41-42 under 35 U.S.C. 103(a) as being unpatentable over Taub further in view of Lemchen and Sachdeva. The Examiner rejected claims 37-39 and 41-42 under 35 U.S.C. 103(a) as being unpatentable over Taub further in view of Lemchen, Sachdeva and Mortenson. Applicant respectfully traverses the rejections for the reasons set forth below.

With respect to claim 1, Applicant would like to clarify a few fundamental differences between Applicant's currently pending claim and the cited references. These differences appear

to have been overlooked by the Examiner, and Applicant hopes the clarification is useful to the Examiner and expedites the examination process.

First, Applicant would first like to draw the Examiner's attention to the elements of claim 1 that require the separate steps of: (1) providing tooth/arch model data, and (2) defining a three-dimensional malocclucded tooth/arch model using the tooth/arch model data as a function of patient information. The language of claim 1 requires that tooth/arch model data is provided that is distinct from the patient's malocclucded tooth/arch model. That is, the literal langue of claim 1 requires that a tooth/arch model data is first provided, then a 3D malocclucded tooth/arch model is defined from that model data using patient information. For further clarification, as recited in claims 12 and 13, the patient information can define patient characteristics such as gender, age, race, tooth size, arch size, impression information, and arch shape. Thus, the literal langue of claim 1 requires that tooth/arch model data is initially provided, and then a 3D malocclucded tooth/arch model is defined from that model data using patient information.

In this manner, certain embodiments recited within the present claims are directed to computer-implemented techniques that *avoid the need for exact digital replicas or models of the teeth*, such as by the digitization of the patient's teeth. As explained in [0067-0068] of the present application, the initial tooth/arch model data can be provided by a library of teeth models. The teeth models can be selected from the digital library and then scaled on the computer based on the particular information for the patient, such as gender, age race, tooth size, arch size and other information. Paragraph [0082] describes how a the computer program may search tooth and arch models from a tooth/arch model database using the patient information and presents the tooth and arch models to a user for selection.

As explained in [0017], the prior art's use of exact digital replicas yields exact measurements that are very representative of the patient's teeth; however, such measurements may not be all that worthwhile for the orthodontic practitioner. For example, the exact replicas or models of the teeth provided by digitization may yield, e.g., by way of a computer analysis, an optimum torque of 5.32 degrees. However, if only predefined and existing orthodontic brackets as listed above were available, the orthodontic practitioner could only pick a bracket yielding a torque of 0 or 7. In other words, although the exact digital replicas or models of the patient's teeth yielded very precise information, such information still resulted in the choice of a discrete

digital value, 0 or 7. In the above example, of course, the orthodontic practitioner would choose a torque of 7.

As further explained in [0018] of the present application, generally, such complex optimum computation and provision of exact replicas or models of teeth is a very complex and costly process, and certain claimed embodiments avoid these unnecessary computations. Embodiments of the invention avoid exact digital replica's and reduce such complexity and cost by a large degree while the optimization regarding the functional process of selecting appropriate brackets is reduced only by a small factor. In other words, definition of a three-dimensional malocclucled tooth/arch model using pre-defined, stored tooth/arch model data and patient-specific information, as opposed to producing and using an exact digital replica of the patient's teeth, provides a beneficial method for selecting one or more predefined and existing orthodontic brackets that avoids the computational complexities required to use exact digital replicas of the patient's teeth. Similarly, as stated in [0066] of the present specification, with respect to at least the selection of brackets, the model data is not an actual model of the patient's actual teeth, but is representative of the patient's teeth. As further described in [0070], the estimated models of teeth selected by the user and utilized for bracket selection are sufficiently close to the patient's actual teeth such that an exact replica of the patient's teeth is unnecessary.

Returning to the language of claim 1, use of a malocclucled tooth/arch model that is defined from provided tooth/arch model data and patient information, as specifically required by claim 1, as opposed to using digitized representations of a patient's actual teeth, reduces the complexity and cost of attempting to provide an exact model or replica of the patient's actual teeth for purposes of bracket selection. Further, the provided tooth models provide a far less complex process of providing separated teeth that can be easily manipulated, as opposed to capturing an actual representation of the teeth and then further needing to perform complex algorithms to separate the teeth captured into individual separated teeth.

Applicant submits that Lemchen in view of the other cited references fail to teach or suggest a method in which a three-dimensional malocclucled tooth/arch model is defined using previously provided tooth/arch model data as a function of patient information, as required by the literal language of claim 1. To the contrary, even if modified in view of the other references, the modified Lemchen system would still utilize a single model that is an exact, digitized replica of

the patient's teeth. For example, with respect to the requirement of claim 1 of "providing tooth/arch model data," the Examiner cites Lemchen at column 2, ll. 55-60. Then, with respect to the requirement of claim 1 of "defining a three-dimensional maloccluded tooth/arch model using the tooth/arch model data as a function of patient information," the Examiner cites the very next passages on col. 3, ll. 1-18. However, a careful read of these passages as a whole reveals that Lemchen describes a process of digitally producing "accurate digital information" of the "maloclused tooth" to produce a digital model of the maloclused tooth. Thus, Lemchen describes only the process of developing a single model using exact digital information of a patient's tooth. Even if Lemchen were modified in view of the other cited references, the result would not achieve a method in which tooth/arch model data is first provide (i.e., data that already models a tooth or dental arch), and then a 3D maloccluded tooth/arch model for a patient is defined using the provided tooth/arch model data and additional patient information, as required by claim 1. These claim elements would still not be present in the resultant system; none of the other cited reference appear to teach or suggest any technique for avoiding use of exact digital replicas of the patient's teeth. The modified Lemchen system would require exactly what Applicant's claim 1 avoids, i.e., generation and manipulation of an exact digital replica of the patient's tooth structure.

Second, Applicant would also like to draw the Examiner's attention to the requirement of claim 1 of executing bracket selection software to select one or more of the plurality of predefined and existing orthodontic brackets for use in moving one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the user-specified desired final positions based on at least the prescription data. This language of claim 1 requires that the bracket selection software select predefined and existing brackets based on the prescription data. As explained above, the prior art's use of exact digital replicas, such as in Lemchen, yield exact measurements that are very representative of the patient's teeth; however, such measurements may not be all that worthwhile for the orthodontic practitioner. For example, an optimum torque calculated for a bracket using an exact replica or model of the teeth provided by digitization thereof is not useful if only predefined and existing orthodontic brackets as listed above were available. To avoid complexity and potential confusion to the practitioner, the bracket selection software of claim 1 operates as aid in selecting the appropriate predefined and existing

orthodontic brackets given the final positions and the prescription data. Therefore, in the event that data modeling resulted in a computed optimal torque or other bracket characteristic does not exactly match one of the available, predefined and existing brackets, the claimed bracket selection software operates as an aid to selecting the appropriate existing bracket given the results of the final positions and the prescription data.

In this manner, the method of claim 1 is fundamentally different from the cited combination of references, and provides much more than simply automating what a practitioner could otherwise do by hand. For example, the embodiment of claim 1 provides the ability to efficiently utilize initial tooth/arch model data to define a 3D patient-specific malocclued tooth/arch model using patient information without requiring exact digital replicas of the patient's teeth. Then, given the fact that only predefined and existing brackets are available for use, the bracket selection software selects orthodontic brackets for use in moving one or more teeth of the defined three-dimensional malocclued tooth/arch model to the user-specified desired final positions based on at least the prescription data. This is fundamentally different from the manner in which the Lemchen system would operate even if modified in view of the other cited references.

For example, as described in detail in Applicant's previous response, Lemchen describes computer-implemented techniques for designing and manufacturing *custom orthodontic appliances* based on the anatomy of the individual patient. According to Lemchen, "straight-wire" orthodontic systems existing at the time of filing were manufactured to conform to malocclusion characteristics of population averages.[1] Lemchen states that, for this reason, there was no individual adaptability in any given prior art system, and a patient's specific pretreatment malocclusion, dental surface morphology, and facial type were completely disregarded.[2] According to Lemchen, the orthodontic method described therein provides a "significant advancement" over these orthodontic practices by utilizing parameters that are *individualized* to the patient.[3]

In this manner, Lemchen makes clear that the essential purpose and principle operation of of the Lemchen system is to provide custom orthodontic appliances, and specifically requires

[1] *Col. 1, ll. 38-41.*
[2] *Col. 1, ll. 41-43.*
[3] *Col. 1, ll. 47-52.*

accurate digital information that defines the shape and location of the patient's malocclused tooth with respect to the patient's jaw,[4] and generation of a mathematical model of the tooth and jaw from the digital information.[5] Lemchen utilizes the exact digital replica of the patient's teeth to compute bracket positions, to modify the brackets to create custom brackets, and to provide for tooth movement to the finish positions that have been computed for the individual patient.[6] In particular, the computerized method described by Lemchen utilizes modification of the angulation of the bracket/tooth interface on an individualized basis in order to cause the bracket to produce a desired force vector on the tooth.[7]

Even if Lemchen were modified in view of Taub, Sachdeva and Mortenson, as suggested by the Examiner, the resultant system would still require the use of exact, digital replica so as to produce the customized, patient-specific brackets desired by Lemchen. For this reason, the resultant system would not utilize pre-provided tooth/arch model data for defining a 3D malocclused tooth/arch model using the provided model data and patient information. Any other result would *change the principle operation* of the Lemchen system, which, in accordance with MPEP 2143.01, is impermissible when forming a prima facie conclusion of obviousness.

Further, because the Lemchen system relies on the ability to customize brackets (e.g., by cutting custom bracket slots for each patient as stated in col. 4 of Lemchen), the modified Lemchen system, as proposed by the Examiner, would not execute bracket selection software to select one or more of the plurality of predefined and existing orthodontic brackets for use in moving one or more teeth of the defined three-dimensional malocclused tooth/arch model to the user-specified desired final positions based on at least the prescription data. Modification of the Lemchen system so as to select existing orthodontic brackets for use in moving one or more teeth of the defined three-dimensional malocclused tooth/arch model to the user-specified desired final positions would *change the principle operation* of the Lemchen system. That is, custom brackets would not be used and, instead, predefined and existing brackets would be used, which Lemchen goes into great length to avoid. In accordance with MPEP 2143.01, the proposed modification is impermissible when forming a prima facie conclusion of obviousness.

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[4] *Col. 2, ll. 54-60.*
[5] *Abstract.*
[6] *Col. 2, ll. 13-15.*
[7] *Col. 4, ll. 33-35.*

The differences between independent claim 44 and the cited references should be even more clear in view of the comments above. Claim 44 requires providing tooth/arch model data for use in defining a three-dimensional maloccluded tooth/arch model. Claim 44 then requires the separate step of providing a user interface for allowing a user to define a three-dimensional maloccluded tooth/arch model as a function of patient information. In rejecting claim 44, the Examiner states that Lemchen teaches all of these elements except a user interface. However, in view of the comments above, it should be clear that Lemchen does not provide any teaching by which a three-dimensional maloccluded tooth/arch model is first provided, and then a three-dimensional maloccluded tooth/arch model for a patient is defined from the tooth/arch model as a function of patient information. Merely adding a user interface to Lemchen, as suggested by the Examiner, would not overcome the fact that Lemchen using a single model, i.e., an exact digital model of the patients teeth, based on a digitization of the patient's tooth structure. The mere addition of a user interface, based on Taub as suggested by the Examiner, would not result in a system that utilizes first provided tooth/arch model data to define a 3D tooth/arch model based on patient information, as required by claim 44. Claims 37 and 55 are patentable over Lemchen in view of the cited references for similar reasons.

For at least these reasons, Lemchen in view of Taub and Sachdeva in view of Mortenson fails to establish a prima facie case for non-patentability of Applicant's claims 1-28, 37-39 and 41-48, 50-69 under 35 U.S.C. 103(a). Withdrawal of this rejection is requested.

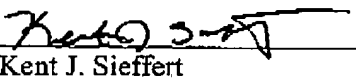
CONCLUSION

All claims in this application are in condition for allowance. Applicant respectfully requests reconsideration and prompt allowance of all pending claims. Please charge any

additional fees or credit any overpayment to deposit account number 50-1778. The Examiner is invited to telephone the below-signed attorney to discuss this application.

Date: August 4, 2006

By:



SHUMAKER & SIEFFERT, P.A.
8425 Seasons Parkway, Suite 105
St. Paul, Minnesota 55125
Telephone: 651.735.1100
Facsimile: 651.735.1102

Name: Kent J. Sieffert
Reg. No.: 41,312